

# MEMORANDUM

---

**PROJECT No: 13772.000.0**

**To:** Gary Kriedt, King County Metro  
**CC:** Lance Peterson, CDM  
**FROM:** Richard Steffel  
**DATE:** September 19, 2007  
**PROJECT:** S. Kirkland Park & Ride Expansion  
**SUBJECT:** Air Quality Impact Review

---

At the request of King County Metro, Geomatrix Consultants, Inc. (Geomatrix) has completed a review of the air quality implications of the proposed expansion of the capacity of the existing South Kirkland Park & Ride at 10610 NE 38th Place in Kirkland, WA. This review was based on consideration of the operation of signalized intersections near the project site, and included both review of the traffic impact analysis of the project and hot-spot air quality modeling of the two most affected signalized intersections. The air quality analysis indicated that traffic related to the proposed project would not likely result in any significant air quality impacts and that the project would, therefore, conform with applicable air quality rules. The remainder of this memo summarizes the methods and the findings of the air quality review.

## Analytical Methods

The air quality analysis consisted of a microscale carbon monoxide hot-spot analysis using computer models recommended or required by EPA guidelines to meet air quality conformity requirements.<sup>(1)</sup> Existing and future predicted traffic conditions with and without the proposed Park & Ride Expansion project were used to estimate worst-case CO concentrations near project-affected intersections in the existing (2007), year-of-opening (2010), and long term horizon (2030) years. The specific models and analysis methods are described below.

---

<sup>(1)</sup> EPA 1992. Guideline for Modeling Carbon Monoxide from Roadway Intersections. Office of Air Quality Planning and Standards. Technical Support Division. Research Triangle Park, North Carolina. EPA-454/R-92-005.



## **Mobile6.2 - Emission Factor Modeling**

A conformity level air quality modeling analysis requires vehicle emission factors for the years of interest. For this purpose, the latest U.S. EPA vehicle emissions factor model, Mobile6.2, is now being used by the Puget Sound Regional Council (PSRC) and other agencies for analyses of various plans and projects. For this analysis, PSRC provided Geomatrix with emissions factors calculated using Mobile6.2, the most recent version of this tool. Mobile6.2 calculates average carbon monoxide emission factors based on a wide array of vehicle classes, basic emission rates, driving patterns, start and running emissions, improved correction factors, and fleet composition. The Mobile6.2 input parameters applied by PSRC were consistent with those used in the development of the latest Washington State Implementation Plan (SIP) for CO. <sup>(2)</sup>

## **CAL3QHC Dispersion Modeling**

Geomatrix used the CAL3QHC dispersion model (version 2) to calculate peak-hour CO concentrations near the single most project-affected intersection (described below). CAL3QHC is designed to calculate pollutant concentrations caused by transportation sources. It considers "free-flow" and "queue" emissions (based on Mobile emission factors) together with intersection geometry, wind direction, and other meteorological factors.

The following assumptions and parameters were used in the CAL3QHC modeling and are consistent with the Washington State CO SIP, CO Maintenance Plan, and EPA guidance for dispersion modeling:

- Critical meteorological parameters included a 1000-meter mixing height, low wind speed (1 meter/second), and a neutral atmosphere (Class D).
- The modeling evaluated 72 wind directions (in 5 degree increments) to ensure worst-case conditions were considered for each receptor location.
- A "background" 1-hour carbon monoxide concentration of 4 ppm was assumed to represent other nearby sources in the vicinity. This is probably a very conservative (i.e., protective) assumption.
- The modeling configuration considered road links extending up to 1000 feet from each intersection.
- Using the procedures required for the CAL3QHC dispersion model, both free-flow and queue links were configured approaching and departing each intersection.

---

<sup>(2)</sup> Emission factors for all years supplied by Chris Peak, PSRC 2007.



- Near-road receptors were placed along both sides of each roadway at 3, 25, 50, and 100 meters from cross streets, 3 meters from the nearest traffic lane, and 1.8 meters above the ground along existing sidewalk locations at breathing height.
- Additional discrete receptors were placed at locations representing the KinderCare® Learning Center playground equipment.
- Existing and projected future PM peak-hour traffic operating conditions provided by The Transpo Group.
- Consistent with EPA guidance, modeled 1-hour CO concentrations were converted to represent 8-hour concentrations using a 0.7 "persistence factor" (i.e., the ratio of 8-hour to 1-hour CO concentrations) to represent variability in both traffic volumes and meteorological conditions.

### **CAL3QHC - Evaluated Intersections**

The intent of an air quality analysis related to surface transportation sources is to examine the potential for impacts at the signalized intersections most likely to be adversely affected by a project. EPA suggests modeling intersections that would be directly affected by a project to the degree that the LOS would be degraded to a LOS "D" or worse due to a project.<sup>(3)</sup> Consistent with EPA guidance, signalized intersections that would be affected by the proposed project were screened for possible dispersion modeling by reviewing the intersection LOS analyses of PM-peak traffic conditions in the project's opening (2010) and horizon (2030) years. Based on this review, Geomatrix identified Northup Way and 108th Avenue NE as the worst performing intersection, operating at LOS "D" or worse in future years, and examined the air quality implications due to delay using detailed dispersion modeling. Due to its proximity to the primary study intersection, the intersection of 108th Avenue NE with the SR-520 WB Ramps was also considered in the aggregated modeling scenario. The dispersion modeling was based on what are probably worst-case conditions, and assumed Northup Way and 108th Avenue NE would not be mitigated to improve traffic flow. The traffic analysis suggested that traffic operations at this intersection could require mitigation due to background growth and buildout of the TOD project, and *not* to the proposed Park & Ride expansion. Therefore the air quality implication of this potential mitigation should be considered in the subsequent review of the TOD project. The current and projected future traffic conditions at the two intersections most affected by the proposed park and ride expansion are listed in [Table 1](#).

---

<sup>(3)</sup> The Level of Service (LOS) scale ranges from "A", which describes signal operations with very low delay (less than 5 seconds per vehicles), to LOS of "F", which describes the worst operating conditions with delays in excess of 60 seconds per vehicle.



**Table 1. Traffic Information for Modeled Intersections**

Intersection		2007	2010		2030	
		Existing	Baseline <sup>(a)</sup>	Project <sup>(b)</sup>	Baseline <sup>(a)</sup>	Project <sup>(b)</sup>
Northup Way and 108th Ave NE	Volume (veh/hr)	3,025	3,340	3,484	4,250	4,394
	Delay (sec/veh)	42	64	74	199	215
	LOS	D	E	E	F	F
SR-520 WB Ramps and 108th Ave NE	Volume (veh/hr)	2,280	2,555	2,665	3,470	3,580
	Delay (sec/veh)	12	11	11	30	30
	LOS	B	B	B	C	C
<sup>(a)</sup> Baseline traffic data included additional trips associated with full buildout of the TOD facility. <sup>(b)</sup> Project traffic data included cumulative trips associated with full buildout of the TOD facility and the additional traffic associated with the Park & Ride expansion.						
<b>Source: The Transpo Group</b>						

## Findings and Conclusions

**Table 2** displays the results of the CAL3QHC dispersion modeling. The reported 1-hour CO concentrations include a 4-ppm background level to account for CO emissions from other sources in the vicinity. Model-calculated CO concentration for these two intersections remain well below the 1-hour average standard of 35 parts per million (ppm) and the 8-hour average standard of 9 ppm.

**Table 2. Maximum Predicted CO Concentration (ppm)**

Intersection	Avg Time	2007	2010		2030		CO Standards
		Existing	Baseline	Project	Baseline	Project	
108 and Northup and WB SR-520 Ramps	1-hr	8.9	8.4	8.5	8.3	8.5	35
	8-hr	6.2	5.9	6.0	5.8	6.0	9
Includes 4-ppm background concentration and conversion of 1-hr to 8-hr results based on 0.7 persistence factor							
<b>Source: Geomatrix Consultants, Inc.</b>							

Based on these findings, operation of the proposed expansion of the South Kirkland Park & Ride would not be expected to result in any significant air quality impacts, and no operational or structural air quality mitigation measures are necessary or proposed. The project would conform with applicable air quality rules and requirements.